

## REMARKS

Applicants appreciate the reopening of prosecution and the detailed examination evidenced by the Office Action mailed June 6, 2006 (hereinafter "Office Action"). Applicants respectfully traverse the rejections of Claims 1-27 under 35 U.S.C. § 103 based on the cited combination of U.S. Patent No. 6,014,943 to Arami et al. (hereinafter "Arami") and U.S. Patent No. 6,199,029 to Ohta et al. (hereinafter "Ohta"), as neither of these references provide teachings alleged in the Office Action. Additionally, Applicants respectfully traverse the rejections of Claims 28-35 under 35 U.S.C. § 103 based on the cited combination of Arami, Ohta, and Applicants' Own Admission (hereinafter "AOA"), as neither Arami, Ohta, nor AOA include all recitations of the claims, as amended.

### **Independent Claims 1, 10, and 19 are patentable over Arami in view of Ohta**

Claims 1-27 stand rejected under 35 U.S.C. § 103 as being unpatentable over Arami in view of Ohta. With respect to Claim 1, the Office Action asserts that Arami discloses "for each of a plurality of cross-sections of the reaction chamber from the configuration and process condition data (col. 1 lines 21-25; col. 5 lines 5-6)," which Applicants note fails to include an activity to be performed "for each of a plurality of cross-sections." Specifically, "for each of a plurality of cross-sections" is a qualifying phrase for the "computing plasma characteristics" defining activity in Claim 1. Later, the Office Action correctly states that "Arami fails expressly to disclose computing plasma characteristics," which, Applicants note, is the activity qualified by the phrase "for each of a plurality of cross-sections" recited in Claim 1. *See* Office Action, page 3. Applicants respectfully submit that the Office Action improperly parses the recitation of Claim 1 to achieve an erroneous rejection.

The Office Action also states that Arami discloses "generating a generalized model of the plasma from the computed plasma characteristics for the plurality of cross-sections (col. 8 lines 60-64; col. 10 lines 39-43)." Office Action, page 3. Applicants respectfully submit that Arami does not disclose "generating a generalized model of the plasma from the computed plasma characteristics for the plurality of cross-sections," as recited in Claim 1, as Arami does not disclose "computed plasma characteristics" that the Office Action properly recognizes as absent from Arami.

Applicants further note that Arami fails to disclose or suggest "for each of a plurality of cross-sections of the reaction chamber" and "generating a generalized model of the plasma from the computed plasma characteristics for the plurality of cross-sections." Rather, Arami describes a plasma processing device and methods of operating the device, but appears devoid of any description or suggestion of computation of plasma characteristics for cross-sections of a reaction chamber, or the use of the computed characteristics from the cross-sections to generate a generalized model of plasma. For example, the only mention of behavior of plasma appears to be a discussion of magnetic fields and non-specific references to plasma density. *See, e.g.*, Arami, columns 7 and 8.

Additionally, the Office Action cites column 1, lines 21-25 and column 5, lines 5-6 of Arami as disclosing "for each of a plurality of cross-sections of the reaction chamber from the configuration process data." Applicants respectfully submit that the cited passage from column 1 includes no mention of cross-sections at all and the cited passage from column 5 merely describes the view used in Figure 1 of Arami as a "schematic cross-sectional view of an etching device," in contrast with "cross-sections of the reaction chamber" of Claim 1. A cross-sectional view and cross-sections of the reaction chamber are not synonymous. Thus, Arami fails to disclose or suggest "for each of a plurality of cross-sections." Accordingly, Arami does not provide several of the teachings alleged in the Office Action.

Ohta appears to describe some bulk-plasma computations, but neither Ohta, Arami, nor a combination thereof disclose, teach or suggest "computing plasma characteristics for each of a plurality of cross-sections of the reaction chamber" as recited in Claim 1. Accordingly, the cited combination of Arami and Ohta does not disclose or suggest several of the recitations of Claim 1.

For at least the foregoing reasons, Applicants submit that Claim 1 is patentable. Applicants submit that independent Claims 10 and 19, which are apparatus and computer program product analogs of Claim 1, are patentable for at least similar reasons.

**Independent Claims 28 And 32 Are Patentable Over  
Arami In View Of Ohta In Further View Of AOA**

Independent Claims 28 and 32 stand rejected under 35 U.S.C. § 103 as being unpatentable over Arami in view of Ohta in further view of AOA. Applicants submit that the rejection of Claims 28 and 32 are overcome because these claims are amended to include the limitations of dependent Claims 29 and 33, respectively. In the rejections of Claims 29 and 33, the Office Action asserts that Arami discloses "plasma simulation at 2-dimensional cross-sections for cross-sectional magnetic field distribution in a characteristic magnetic field direction (Fig. 9)." Office Action, pages 7-8. In contrast with this characterization of the Office Action, Arami at Fig. 9 describes a "plan view of a dipole ring magnet used in the etching device of Fig. 6 showing the magnetizing direction of individual segment magnets arranged in the dipole ring magnet." Arami, column 4, lines 52-54. The allegation made in the rejection of Claims 29 and 33 is, thus, factually erroneous. For at least this reason and the reasons discussed above regarding Claim 1, Claims 28 and 32, which include the limitations of Claims 29 and 33, are patentable over the cited references.

**The Dependent Claims Are Patentable**

Applicants submit that the dependent claims are patentable at least by virtue of the patentability of the various ones of independent Claims 1, 10, 19, 28, and 32 from which they depend.

For example, Claim 2 recites "wherein the plurality of moving magnets rotate about an axis of rotation, and wherein each of the plurality of cross-sections includes the axis of rotation." In rejecting Claim 2, the Office Action cites Fig. 9 as teaching these recitations. As discussed above, while Fig. 9 appears to be "a plan view of a dipole ring magnet used in the etching device of Fig. 6 showing the magnetizing direction of individual segment magnets arranged in the dipole ring magnet" (Arami, column 4, lines 52-54), Fig. 9 does not disclose or suggest "computing plasma characteristics for each of a plurality of cross-sections of the reaction chamber" that include "the axis of rotation." As noted above, Arami simply does not deal with plasma simulation. For at least these reasons, Applicants submit that Claim 2, and related apparatus and computer program product Claims 11 and 20, are separately patentable.

Claim 3 recites:

...wherein computing plasma characteristics for each of a plurality of cross-sections of the reaction chamber comprises performing the following actions for each of the cross-sections:

computing electron density and temperature for the cross-section using an iterative Monte Carlo computational procedure; and

computing ion and neutral species transmission phenomena for the cross-section from a plasma dynamics simulation.

In rejecting Claim 3, the Office Action first states that Ohta discloses computing electron density and temperature for the cross-section using an iterative Monte Carlo computational procedure (col. 3 lines 10-11; col. 3 lines 49-52). This is incorrect. The cited portions of Ohta disclose calculating a particle density in a bulk plasma region (*See* Ohta, col. 3, lines 6-11) and "[t]he chemical reaction that will occur on the minute surface region due to the selected incoming particle and the selected absorption species is selected using the Monte Carlo method." Ohta, col. 3, lines 49-52. There is nothing in the cited material that teaches or suggests "computing electron density and temperature for the cross-section using an iterative Monte Carlo computational procedure." For at least these reasons, Applicants respectfully submit that Claim 3, and related apparatus and computer program product Claims 12 and 21 are separately patentable.

Claim 5 recites "determining a static magnetic field generated by the moving magnets, and wherein computing plasma characteristics for each of a plurality of cross-sections of the reaction chamber comprises computing the plasma characteristics for each of the plurality of cross-sections from the determined static magnetic field, shape information for the reaction chamber, and plasma collision reaction data." The Office Action cites column 1, lines 21-25 and column 5, lines 5-7 as disclosing "determining a static magnetic field generated by the moving magnets, and wherein computing plasma characteristics for each of a plurality of cross-sections of the reaction chamber." Office Action, page 4. The cited passage from column 1 merely states that for an etching device, it is desirable to attain micro-processing by generating a high density plasma in a process chamber and that it is desirable to have the etching performed uniformly over the entire wafer at a higher rate. There is nothing here that teaches or suggests "determining a static magnetic field generated by the moving magnets." The cited passage from column 5 merely describes Fig. 1 as a schematic cross-sectional view

of an etching device that has a process chamber. There is also nothing here that teaches or suggests "determining a static magnetic field generated by the moving magnets." The Office Action also cites the same two passages as disclosing "computing the plasma characteristics for each of the plurality of cross-sections." Office Action, page 5. This is incorrect. As shown above, there is nothing in the cited passages that teaches or suggests "computing the plasma characteristics for each of the plurality of cross-sections." The Office Action further cites column 1, lines 26-35 as disclosing "from the determined static magnetic field, shape information for the reaction chamber, and plasma collision reaction data." Office Action, page 5. The cited passage merely states that a dipole ring magnet is formed of multiple anisotropic segment magnets arranged on the outer periphery of a process vessel and that this device can provide improved uniformity of a magnetic field. There is nothing here that teaches or suggests "from the determined static magnetic field, shape information for the reaction chamber, and plasma collision reaction data." For at least these reasons, Applicants submit that Claim 5, and related apparatus and computer program product Claims 14 and 23 are separately patentable.

Similar misapplications of the references are found throughout the rejections of the dependent claims. Applicants respectfully note that each of these rejections is characterized by noting superficial correspondences between features in the references and the claims that are related only because the claims and the references use some common terminology (*e.g.*, "Monte Carlo simulation," "electron density," "temperature," etc.). Applicants are claiming specific operations in simulations, not broad, general concepts like "Monte Carlo computation" and "plasma simulation." The Office Action generally does not provide evidence as to where such specific claim recitations are taught or suggested by the references, and accordingly, Applicants submit that many of the rejections of the dependent claims are erroneous and should be withdrawn. In the interest of brevity, Applicants defer further discussion of the separate patentability of the dependent claims pending consideration of the issues discussed above.

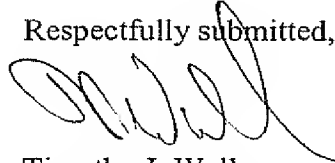
### **Conclusion**

Applicants submit that the objections to the specifications and claims have been overcome, and that the claims are patentable for at least the reasons discussed above.

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Serial No.: 09/995,421  
Filed: November 27, 2001  
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Applicants respectfully request allowance of the claims and passing of the application to issue in due course. Applicants encourage the Examiner to contact the undersigned by telephone to resolve any remaining issues.

Respectfully submitted,

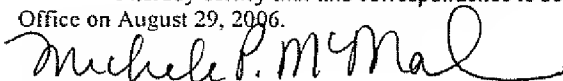


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**CERTIFICATION OF ELECTRONIC TRANSMISSION**

I hereby certify that this correspondence is being transmitted electronically to the U.S. Patent and Trademark Office on August 29, 2006.

  
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